



7th
European Conference
on Residual Stresses

ECRS7

PROGRAM

Berlin

13-15 September 2006

Thursday, 14th September 2006

8.30

INVITED LECTURE

H 1028

Chairman: A. Pyzalla | L. Edwards | Influence of residual stress redistribution on fatigue crack growth and damage tolerant design

9.10

Coffee Break

	SESSION 4A MEASURING METHODS IV		SESSION 4B MATERIAL PROCESSING IV		SESSION 4C SIMULATION IV	
	H 1028	Chairman: R.L. Peng	H 2035	Chairman: J.L. Lebrun	H 2036	Chairman: J.-M. Sprauel
9.30	M. Seefeldt, A. Walentek, P. van Houtte, M. Vrána and P. Lukáš Neutron and X-ray diffraction analysis of residual stresses in cold-rolled pearlitic steel sheet		T. Nitschke-Pagel and H. Eslami-Chalandar Residual stresses in welded joints after different mechanical surface treatments		D. Dini, A.M. Korsunsky and F.E. Dunne Diffraction post-processor for polycrystalline plasticity modelling	
9.50	T. Sasaki, S. Takahashi, K. Iwafuchi, Y. Satoh, Y. Kanematsu, M. Chiba and S. Takago Residual stress in railway rails by IP/cos α method		A. Kouadri and L. Barrallier Characterisation of residual stresses by X-ray diffraction of laser welded AZ91 magnesium alloy		C. Redl, C. Friesenbichler and V. Wieser Numerical simulation of residual stresses during the heat treatment of dies made of hot work tool steel	
10.10	C. Woo, Z. Feng, X.-L. Wang, K. An, W.B. Bailey, S.A. David, C.R. Hubbard and H. Choo Feasibility of thermal strain measurements during quasi-steady state using neutron diffraction		P. Staron, W.V. Vaidya, M. Koçak, J. Homeyer and J. Hackius Residual stresses in laser beam welded butt joints of the airframe aluminium alloy AA6056		S. Fréour, F. Jacquemin and R. Guillén Numerical and analytical scale-transition prediction of hygro-mechanical stresses in multidirectional carbon-epoxy laminates	
10.30	M. Karadige, B. Grant, G. Bruno, J. Santisteban, P.J. Withers and M. Preuss A comparison of strain measurements on an inertia friction weld using the ENGIN-X and SALSA neutron strain mapping instruments		F. Bayraktar, R. Staron, M. Koçak and A. Schreyer Residual stress analysis of laser welded aluminium T-joints using neutron diffraction		L.K. Keppas, D.E. Katsareas, R.C. Wimpory, N.K. Anifantis and A. Youtzos Letterbox type repair weld finite element simulation and residual stress prediction	

10.50

Coffee Break

	SESSION 5A MEASURING METHODS V		SESSION 5B MATERIAL PROCESSING V		SESSION 5C SIMULATION V	
	H 1028	Chairman: M. Oden	H 2035	Chairman: J.C. Outeiro	H 2036	Chairman: J.-M. Sprauel
11.10	H. Qozam, J. Hoblos, G. Bourse, C. Robin, H. Walaszek, P. Bouteille and M. Cherfaoui Ultrasonic stress measurement in welded component by using Lcr Waves: Analysis of the microstructure effect		E.M. van der Aa, M.J.M. Hermans, I.M. Richardson, N.M. van der Pers and R. Delhez Experimental study of the influence of a trailing heat sink on the welding residual stress distribution		S. Berbenni and M. Berveiller Effect of grain size distribution on second order stresses in plastically deformed polycrystals	
11.30	J. Ribeiro, M. Vaz, Paulo Piloto, J. Monteiro and H. Lopes Residual stress assessment using optical techniques		P. Barreiro, V. Schulze and D. Löhe Development and effects of residual stresses in joints produced by electromagnetic compression and its implication on the mechanical properties		D. Gloaguen, J. Fajoui, B. Courant and R. Guillén Numerical study of the influence of dislocation microstructure on metallic materials mechanical behaviour	
11.50	A. Maras, G. Montay, O. Sicot, E. Rouhaud and M. François A new approach in residual stresses gradient analysis by speckle interferometry		J.R. Santisteban, L. Fernández, H. Corso, R.L. Martinez, L. Bocanera, L. Edwards, J.A. James and M. Turski Post-weld heat treatment stress relaxation in zircaloy 4 plasma welds		R. Rentsch and E. Brinksmeier Numerical simulation of residual stresses on the grain and sub-grain length scale using atomistic modeling	
12.10	K.L. Muratkov and A.L. Glazov Laser photoacoustic microscopy of mechanical stresses in modern ceramics and metals		M. Belassel, J. Pineault and M.E. Brauss Development of instrument for residual stress measurement in a 50 mm inner diameter power generation pipes		J.-P. Mathieu, D. Bouscaud, K. Inal, S. Berveiller and O. Diard Plastic heterogeneities characterisation in 16MND5 RPV steel by X-ray diffraction, comparison with finite-element approach	

12.30

Lunch | Ludwig Erhard Building | Fasanenstr. 85

	SESSION 6A MEASURING METHODS VI		SESSION 6B MATERIAL PROCESSING VI		SESSION 6C Layers I	
	H 1028	Chairman: M. François	H 2035	Chairman: A. Baczmarski	H 2036	Chairman: K. Inal
14.00	A.T. Fry and J.D. Lord Measuring the variation of residual stress with depth: A validation exercise for fine incremental hole drilling		S. Fréour, E. Girard and R. Guillén Measurement and interpretation of residual stresses induced in Ti-17 by machining conditions		J. Peng, V. Ji, J.-M. Zhang and W. Seiler Residual stresses gradient determination in Cu thin films	
14.20	G. Montay, A. Cherouat and J. Lu Residual stress analysis in crankshaft using the hole drilling method		G. Germain, F. Morel, J.-L. Lebrun, A. Morel and B. Huneau Effect of laser assistance machining on residual stress and fatigue strength for a bearing steel (100Cr6) and a titanium alloy (Ti 6Al 4V)		M. Klaus, I.A. Denks and Ch. Genzel X-ray diffraction analysis of nonuniform residual stress fields $\sigma_{ij}(\tau)$ under difficult conditions	
14.40	A.T. DeWald and M.R. Hill Method for mapping multi-axial residual stresses in continuously-processed bodies		J.C. Outeiro and A.M. Dias Influence of work material properties on residual stresses and work hardening induced by machining		B. Denkena and B. Breidenstein Residual stress gradients in PVD-coated carbide cutting tools	
15.00	W.R. Mabe, W.J. Koller, A.M. Holloway and P.R. Stukenborg Deep hole drill residual stress measurement technique experimental validation		M. Habak, J.-L. Lebrun, S. Waldmann, P. Robert and C. Fischer Residual stress in high-pressure water jet assisted turning of austenitic stainless steel		B.B. He Measurement of residual stresses in thin films by two-dimensional XRD	
15.20	B. Podgornik, J. Vižintin and F. Kopač Application of hole-drilling method in practice		W. Li, M. Preuss, P.J. Withers, D. Axinte and P. Andrews Characterisation of residual stresses in machined surfaces of a high strength nickel-base superalloy		M.R. Terner, P. Hedström, J. Almer, J. Ilavsk and M. Oden Residual stress evolution during decomposition of Ti _(1-x) Al _x N coatings using high-energy X-rays	

RESIDUAL STRESS ASSESSEMENT USING OPTICAL TECHNIQUES

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Conference Topic: Developments in Measurements Methods of RS

Abstract

1. INTRODUCTION

The goal of this work is the development of different experimental techniques to measure residual stresses as alternative of hole-drilling method with strain gages. The proposed experimental techniques are based on the use of Moiré Interferometry and Digital Speckle Pattern Interferometry. They are field techniques that allow measure in-plane displacements without contact and with high resolution. Grating replication techniques are developed to record high quality diffraction gratings onto the specimen's surfaces. It is also, developed an optical assembly of laser interferometry used to generate the master grating (virtual). It is design and implemented an in-plane interferometer to measure displacements in different directions. It is developed a drilling equipment to provoke the stress relaxation in the specimens. During residual stresses measurements the obtained fringe patterns (Moiré and speckle) are video recorded. Image processing techniques are used to assess the in-plane strain field. A finite elements code (ANSYS®) is used to simulate the process of relaxation of stresses to compare with experimental results and to calculate the hole-drilling calibration constants.

References

- Lu, J; James, M. R. and others "Handbook of Measurement of Residual Stresses", Society for Experimental, Inc., Edited by Jian Lu, 1996.
- Post, D.; Han, B.; Ifju, P. "High Sensitivity Moiré: Experimental Analysis for Mechanics and Materials" Springer Verlag, 1997.
- Albertazzi Jr., A., Kanda, C., Borges, M. R., Hrebabetzky, F., *Portable Residual Stresses Measurement Device Using ESPI and a Radial In-Plane Interferometer*, Laser Metrology for Precision Measurement and Inspection in Industry, Albertazzi Jr., A., Eds., Proc. SPIE, 4420, pg. 112-122, 2001.

- Wu, Z.; Lu, J.; Han, B. "Study of Residual Stress Distribution of Moiré Interferometry and Incremental Hole Drilling", Journal of Applied Mechanics, Vol. 65, pg. 837-850, December 1998.
- O. C. Zienkiewicz and R. L. Taylor, The finite element method, McGraw Hill, Vol. I, 1998.